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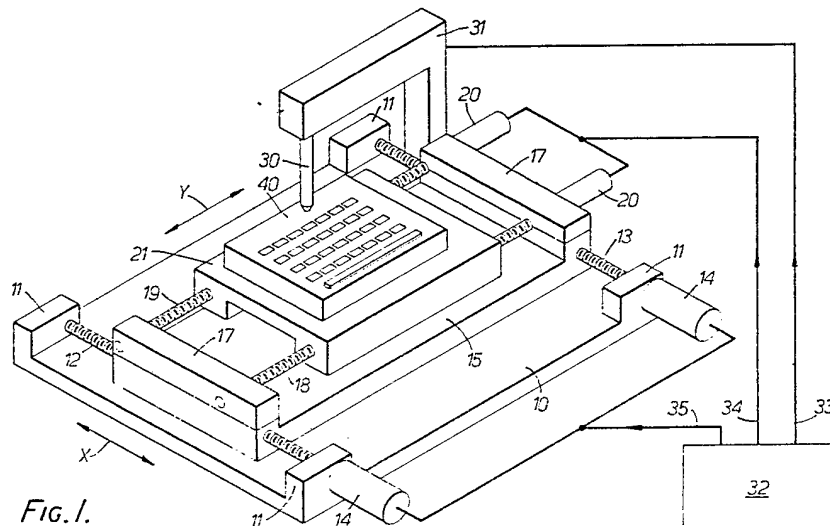
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1543, 1544.

(58) Field of search
B6F
G3N

(54) Marking machine

(57) Marking apparatus, particularly suitable for marking the keys of an assembled keyboard 40, includes a non-impact marking device 30, e.g. an ink-jet or laser marker, supported over a support surface for the article to be marked. Either the marking device or the support surface is located along X, Y axes under the control of control means 32, which also controls the operation of the marking device, in accordance with a program so as to apply selected marks at selected locations on the article. Preferably, the control means includes a microprocessor computer system.



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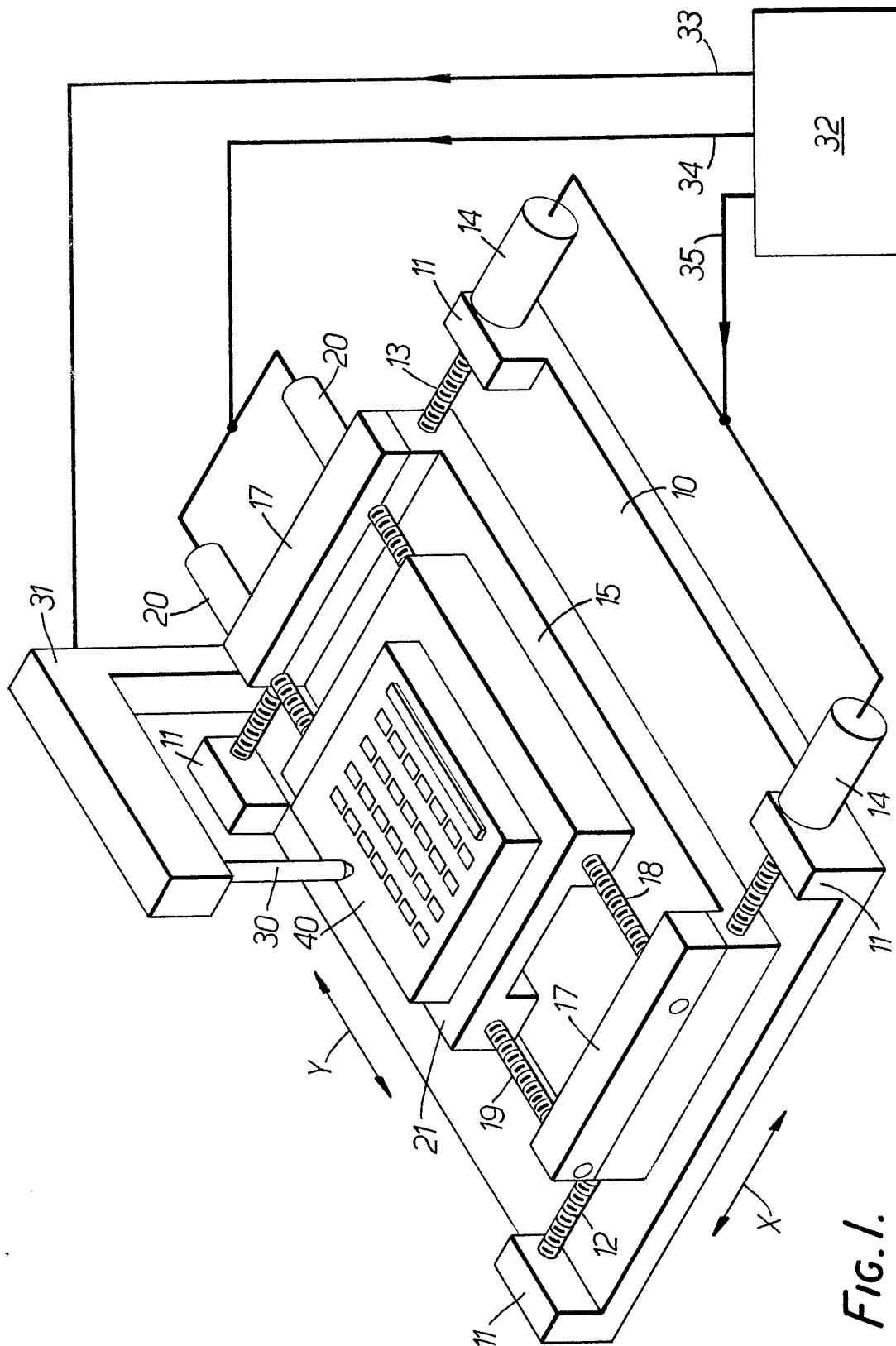


FIG. 1.

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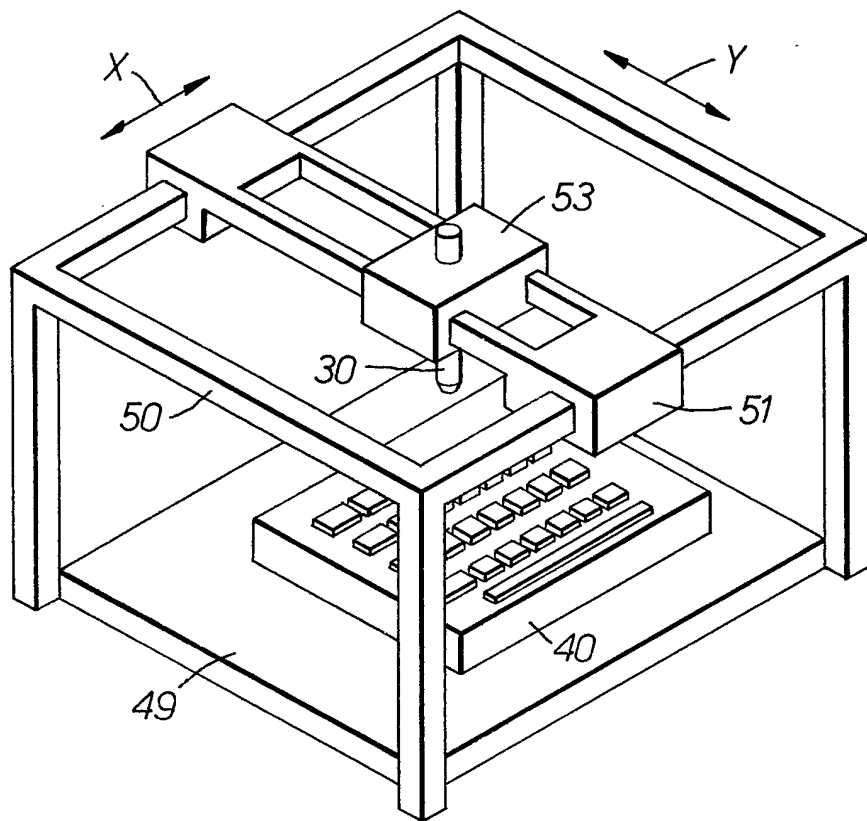


FIG. 2.

SPECIFICATION

Marking machine

5 This invention relates to marking apparatus and in particular to such apparatus for marking the keys of keyboards with selected characters.

Hitherto the keys of keyboards have been marked individually prior to assembly into the final keyboard. In one example, the keys are produced by two-shot injection moulding so as to be moulded complete with the required marking as one colour: this necessitates a different mould for every differently marked key. In another example, each key is marked by an offset printing process for which a master plate is required, engraved with the required marking. In a third example, each key is marked by a thermostatic printing (or sublimation) process, wherein a master sheet with the required mark is photographically produced and the mark is transferred to the key top through the application of heat and pressure. In the latter two examples, fresh masters are required for each different mark or set of marks and the transfer process involves the application of pressure to the key top.

An object of the present invention is to provide marking apparatus which is versatile as to the marks and layout of marks which can be applied to an article to be marked, without any necessity for fresh masters or tooling for each marking change.

Another object of the invention is to provide marking apparatus which is capable of marking all the keys of an assembled keyboard in a simple and accurate manner.

A further object of the invention is to provide marking apparatus which is capable of marking a floating key (e.g. a spring-loaded key in a keyboard) without contact between the marking device and the key.

According to the present invention there is provided marking apparatus comprising a support surface for an article to be marked, a non-impact marking device, means for supporting said marking device in spaced relationship above said support surface, means for moving said support surface and said marking device relative to each other such that said marking device may be located over any position within a predetermined area of such support surface, and control means selectively programmed or programmable with the configuration of marks to be applied to the article to be marked, said control means being arranged to effect said relative movement and actuate said marking device in accordance with its program so as to apply selected marks at selected locations on an article to be marked located on said support surface.

Embodiments of the invention will now be described with reference to the accompanying drawings, in which:-

Figure 1 is a perspective view in diagrammatic form of one embodiment of the invention; and

Figure 2 is a perspective view in simplified diagrammatic form of another embodiment of the in-

vention.

Referring to *Figure 1*, there is shown one embodiment of the invention comprising a rectangular base plate 10 at each corner of which is mounted a bearing housing 11. A screw thread 12 is mounted between one pair of bearing housings and a screwthread 13 is mounted between the other pair of bearing housings. The screw threads 12 and 13 are connected for rotational driving movement to respective D.C. servo-motors 14. A carriage 15 is mounted on and between the screw threads 12 and 13 and is engaged with the screw threads so that operation of the servo-motors 14 will cause the carriage to move relative to the baseplate 10 along an X-axis in one of the directions indicated by the arrows X.

A similar arrangement is provided on the carriage 15, comprising bearing housings 17, screw threads 18 and 19 D.C. servo-motors 20, and a further carriage 21. This arrangement is such that operation of the servo-motors 20 will cause the carriage 21 to move relative to the carriage 15 along a Y axis in one of the directions indicated by the arrows Y, which are at right-angles to the directions indicated by the arrows X.

Positioned in spaced relationship above the carriage 21 is a marking device 30 mounted on a stationary arm 31 and located centrally of the base plate 10. The marking device is of the non-impact variety and may be, for example, a laser or ink-jet market.

The apparatus as so far described is controlled by a microprocessor computer system represented by the box 32 and having an output 33 for controlling the marking device 30, an output 34 for controlling the servo-motors 20, and an output 35 for controlling the servo-motors 14.

In use, an article to be marked is located on the carriage 21 and retained, if necessary, by means not shown. A predetermined operating program, for example recorded on a floppy disc, is entered into the computer, and this is supplemented by instructions entered manually by way of the computer system keyboard. The computer is then operated to cause the article to be marked to be positioned at desired locations beneath the marking device and to be moved at those locations in the configuration of desired marks during operation of the marking device.

In *Figure 1*, a fully assembled keyboard 40 is shown as the article to be marked. The present invention is particularly suitable for such an application, in that each key of the keyboard can be located in succession under the marking device and the desired unique mark can be applied without impact to the, normally spring-loaded key.

The marking device may comprise an ink jet marker of the type which executes a raster scan over the area of each mark with the jet prevented from impinging upon the target except at the required points.

The marks (whether alpha-numeric or otherwise) may be of any desired form if suitably programmed into the computer system, and likewise the layout of marks may be selected at will and

programmed into the computer.

Once a keyboard or other workpiece has been marked, it is removed from the carriage 21 and the next workpiece is accurately located on the carriage. This next workpiece may be marked with the same marks and layout of marks as the previous workpiece, or with different marks and/or layout.

The invention will thus be seen to be capable of notable versatility as to the marks and layout of marks which it can apply, without any requirement for fresh masters or tooling for each change. The invention in particular provides for marking all the keys of an assembled keyboard, thus simplifying manufacture of the keys and assembly of the keyboard whilst enabling a full choice for the markings of the individual keyboards. The invention enables stepped keyboards and keys with curved (E.G. concave) surfaces, to be marked.

If necessary, means may be provided for appropriate displacement of the marking device along a Z axis vertically in a direction perpendicular to the surface of the carriage 21. The offset printing and thermostatic printing processes hereinbefore referred to would not be suited in marking the keys of an assembled keyboard because in particular they would be unable to cope with stepped keyboards or with curved key surfaces or the movement of the keys under pressure without severe difficulties.

An alternative embodiment of the invention is briefly indicated in Figure 2, in which the marking device 30 is mounted for movement across the article to be marked, shown as a keyboard 40 which is located on a stationary support surface 49 beneath the marking device. A framework 50 supports a carriage 51 which is movable in the directions indicated by the arrows X. The carriage 51 supports a carriage 53 which carries the marking device and is movable in the directions indicated by the arrows Y. In substantially all other respects, the apparatus is the same as that described with reference to Figure 1 and is operated and controlled in a similar way.

Apart from marking the keys of an assembled keyboard, marking apparatus in accordance with the present invention may be used for marking instrument front panels and other panels: for example the instrument or other apparatus may be assembled and then the assembled panels marked using the apparatus of this invention.

CLAIMS:

1. Marking apparatus comprising a support surface for an article to be marked, a non-impact marking device, means for supporting said marking device in spaced relationship above said support surface, means for moving said support surface and said marking device relative to each other such that said marking device may be located over any position within a predetermined area of said support surface, and control means selectively programmed or programmable with the configuration of marks to be applied to the article to be marked, said control means being arranged

to effect said relative movement and actuate said marking device in accordance with its program so as to apply selected marks at selected locations on an article to be marked located on said support surface.

2. Marking apparatus as claimed in claim 1, wherein said support surface is maintained stationary and said moving means moves said marking device over said support surface.

3. Marking apparatus as claimed in claim 1, wherein said marking device is maintained stationary and said moving means moves said support surface under said marking device.

4. Marking apparatus as claimed in any preceding claim, wherein said moving means comprises a first carriage, means for locating said carriage along an X axis, a second carriage mounted on said first carriage, and means for locating said second carriage along a Y axis.

5. Marking apparatus as claimed in claims 2 and 4, wherein said marking device is mounted on said second carriage.

6. Marking apparatus as claimed in claims 3 and 4, wherein said support surface is mounted on said second carriage.

7. Marking apparatus as claimed in claim 4 or any claims appended thereto, wherein said means for locating said carriage include D.C. servo-motors.

8. Marking apparatus as claimed in any preceding claim, wherein said marking device is a laser marker.

9. Marking apparatus as claimed in any of claims 1 to 7, wherein said marking device is an ink-jet marker.

10. Marking apparatus as claimed in any preceding claim, wherein said control means includes a micro-processor computer system.

11. Marking apparatus as claimed in any preceding claim, adapted to mark the keys of an assembled keyboard.

12. Marking apparatus constructed and adapted to operate substantially as herein described with reference to Figures 1 or 2 of the accompanying drawings.